D R A F T

Harpers Comments

PROJECT OBJECTIVE

MATERIALS HANDLING STUDY (NON-DIGITALLY STORED DATA)

1. INTRODUCTION.

1.1. Purpose. This document conveys the background, concept, and scope for a Government sponsored study program to improve the handling of non-digitally stored information and materials used in the NPIC imagery exploitation process.

1.1.1. For the purposes of this document, the words "information," "material," and "data" are intended to mean that "information," "material," and "data" which is not suitable for digital processing, storage, and retrival. To the extent that automated Indexes to this "information," "material," and "data" will be maintained in digital form on the Center's central computer complex. the memory, they

1.1.2. This project is to consider all imagery sensor systems which may be ultimately photographically recorded as well as all non-digitally stored collateral data such as maps, briefing aids, etc.

1.1.3. The proposed study project is to enable management to determine the most effective methods of generating, storing, retrieving, delivering and utilizing non-digital stored information in the imagery exploitation process.

1.2. Background. Current and anticipated increases in the volume of imagery and collateral data inputs to NPIC ~~necessitates~~ (makes desirable a study of current and projected requirements to determine more efficient methods of screening, handling, storing, updating, and accessing these materials. ~~It~~ can be developed) It is currently estimated that there are between 1,000,000 and 2,000,000 separate items on hand, e.g., (1,250,000 maps and charts; 75,000 reports; 20,000 books and magazines; 50,000 to 100,000 other miscellaneous indexes and files; and in excess of 150,000 photographs, [and undeterminate number of which exist in random "chip" form]) The manual methods used to reproduce, store, retrieve, control, and transport these items are unwieldy

and time consuming. Some form of automation is needed to handle those materials now. Future increases in the volume of acquired imagery and supporting data will necessitate a substantial automation program if rapid and efficient utilization of people and material is to be maintained. Of specific importance in this process is the unit of cut film or "chip." In addition to its use and implications as an information storage and retrieval medium, it is extensively used in the interpretation process. Reconnaissance imagery is normally photographically recorded (in either its original or secondary form) and initially interpreted in the roll film mode; however, specific areas of interest are normally cut from the roll film for further, detailed analysis and for future reference. The use of these photo chips simplifies film handling problems, especially when this analysis requires the viewing of stereoscopic pairs, and allows the use of more convenient, simpler, and higher quality optical instruments than are available for viewing roll film. Although many roll film stereoviewers have been developed, they do not compare favorably in optical quality, human engineering, and cost effectiveness with those stereoviewers which can be used in the interpretation of photo-chips. Furthermore, only one interpreter at a time can use a roll of film, even though it may contain numerous targets, whereas the chips can be distributed to any number of interpreters. In addition to ~~Mission~~ chips, which are used for imagery analysis, there are Data Base chips, which are used for reference (maps, charts, mosaics, etc.) for comparison (ground photography, previous coverage, tec.), and Collateral Chips, which contain textual information. While each type of chip has its unique requirements based on its use and information content, many individuals frequently think of the different uses in common because they are all referred to as "CHIPS." The most outstanding example of this is the frequent misunderstanding of the D.O.D. 70mm X 100mm Tactical Reconnaissance Chip. This chip was designed primarily for main-

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taining and upgrading field operation data bases. It was not intended to satisfy detailed interpretation requirements, ~~and only secondary provisions were made for incorporating~~ collateral data ~~in this chip~~. Considerable "in house" effort has taken place to date on the use and standardization of chips and this document has gone into the problem in depth where as other areas of the ~~xxxxxx~~ materials handling problem are not as well understood and therefore are not discussed to the same depth herein. However, all phases of the materials handling problem must receive equal consideration.

2. CONCEPT.

2.1. ~~Purpose~~. The planned study program will encompass the identified problem areas, identify additional problem areas through the investigation and analysis of current procedures, and make recommendations for possible detailed alternate solutions and for the establishment of practical and feasible future automation levels. Ultimately, the results of this study will be used to develop and install appropriate instrumentation and procedures to minimize the problems in handling material and data.

2.2. Scope. The total program, as envisioned, will be divided into the following separate but interrelated phases and tasks. Proposals solicited hereunder are to be restricted to the tasks outlined in Phase I(Paragraph 2.2.1 and 2.2.2) and Phase II (Paragraphs 2.2.3). Phase III (Paragraph 2.2.4) is included as a matter of information and as an aid in developing the material required under Phase I and II.

2.2.1. Phase I, ~~Task~~ A. The contractor ~~is expected to~~ will thoroughly investigate, review, and analyze current procedures for handling material and data within NPIC, determine the requirements for such material and data, and generate ~~a~~ conceptual plans for ~~a~~ systems to ~~alleviate the handling~~ satisfy these requirements

problems in this area. The conceptual plan should include solutions to material and data handling problems identified during the investigation, including the results of Phase I, Task B, and particularly to the following problems areas:

(a) Means of improving access to, updating, and distributing textual collateral data.

(b) A rapid method for selecting, controlling, retrieving, reproducing, and disseminating collateral photography (photography derived from previous coverage, [redacted] including ground as well as aerial photography).

STAT

(c) A method for storing, retrieving, and displaying maps, and charts, in support of the photographic interpretation effort.

(d) Techniques for automatically producing, updating, storing, retrieving, and displaying mission coverage plots (graphics portion of plots only, since textual matter will be handled by the central computer complex).

2.2.2. Phase II, Task B. The contractor is expected to thoroughly investigate, review, and analyze current NPIC procedures for producing and utilizing all types of chips used for interpretation (as compared with collateral material problems delineated under Task A), and to evaluate proposed new collection systems, and, if such a course is appropriate, to generate a conceptual plan for an operational interpretation chip concept which will improve the efficiency and increase the automation potential for the imagery exploitation process. The primary objective for this task is to determine the validity of standardizing the chips for interpretation purposes and include solutions to chip making and utilization problems identified during the investigation and be guided by the following assumptions:

(a) Chips are required as a valid P.I. technique; however, roll film

will continue to be required ~~for the initial readout and~~ scanning operation.

(b) Any operational chip concept derived will be, if accepted, an integrated segment of the total imagery exploitation operational plan.

(c) Any ~~chip concept~~ system developed must be capable of handling all forms of imagery input; e.g., black-and-white [redacted] STAT

[redacted] STAT

(d) Any ~~operational P.I.~~ chip ~~concept~~ must ~~make provisions for on-line real time~~ mensuration.

(e) Initially, a centralized automatic storage and retrieval system is not required for chips intended solely for imagery analysis (P.I. Chip).

(f) Initially there will be no external distribution of chips selected for use in NPIC.

2.2.3. Phase II, System and Equipment Definition. Based on the conceptual plans resulting from the studys in Phase I, alternate ~~proposed systems~~ will be developed and evaluated. ~~Since Phase I, Tasks A&B are eventually intimately related, Phase II will treat them as one integrated task.~~ The report on this phase will include a thorough analysis and comparison of all alternates considered i.e., rejected proposed alternates will be discussed as well as the alternate system which is deemed most desirable. The report will be both quantitative and qualitative in measuring one proposed alternative against the other and in demonstrating the amount of improvement each alternative could achieve over the present system. The use of aperture cards, microfiche, closed circuit TV, and other known methods of storing, retrieving, and disseminating data should be considered in developing the alternative systems. A detailed system plan based on the selected alternate should be prepaired and should include system and equipment parameters, implementation time, impact on operational and using components of the

Center, personnel and personnel training requirements, and the estimated costs of the proposal system for development, installation and operation.

2.2.4. Phase III, Equipment Development, Acquisition and Installation. Utilizing the specifications generated under Phase II, it is the intent of the Government to solicit proposals for a modern material and data handling system. Proposals will include equipment modification, development, installation, ~~and the required~~ training of personnel. It should be reiterated that Phase III is discussed for information and guidance only and is not to be included in the proposal.

2.2.5. The NPIC is funding separate studies in other major program efforts, including human factors, unconventional imagery, digital information handling, and image analysis. The successful contractor for the study outlined herein will be expected to perform in association with the other program efforts so as to avoid duplication of effort and insure compatibility of systems.

3. REQUIREMENTS.

3.1. Phase I, ~~Objectives~~. Two major reports stemming from the Investigation and Analysis Phase, ~~Tasks A&B (paragraphs 2.2.1 and 2.2.2)~~ are to be delivered. The first report is to cover the contractors analysis of NPIC processes and ~~should identify~~ identifying requirements for the information utilized by NPIC which ~~lends itself to non-~~ will not be handled in digital ~~handling~~ system. The second report is to present ~~the~~ conceptual deisgns and evaluations thereof for meeting these requirements ~~generated by the contractor as a solution to the identified problems~~.

~~For reporting purposes Tasks A&B may be prepared separately if circumstances warrant it.~~

3.1.1. ~~The primary requirement of Phase I, Task B is to derive an operational imagery interpretation chip concept, while the overall report~~ is ~~to cover the contractors~~ an analysis and evaluations of the use of chips for: ~~(1)~~ image interpretation ~~(I.I. Chip)~~ and (2) data base reference, ~~and (3) collateral data~~. ~~In developing the conceptual design for the image interpretation chip~~

the following factors must be examined in depth as that judgment can be made as to the amount of improvement the implementation of the proposed concept would achieve.

(a) Determine how, when, and under what circumstances chips (of any types) could be more effectively utilized than roll film, hard copy, or viewed displays.

(b) Examine the problems of chip standardization between or within both the chip-making process (print versus cut), and chip use (interpretation, reference, and collateral).

(c) Determine the cost effectiveness of different chipping techniques, such as scissors or die cutting from a roll of film, or selective printing through reproduction techniques. Total reproduction costs from the point of the supplied negative to the delivered chip (cut or printed) must be included. To be included in the analysis is the problem of handling, controlling, and disposing of cut up or partial rolls of film.

(d) Examine the problems and techniques for incorporating human readable and/or machine readable codes on the chips. This effort should include an examination and discussion of the problems of obtaining chips by both the cutting and printing processes.

(e) Examine the problems and techniques of maintaining security control and accountability for all types of chips and methods of production.

(f) Examine the requirement, desireability, problems and techniques for incorporating collateral textual information on a chip intended for reference or interpretation purposes.

(g) Prepare an error analysis of mensuration performed on a chip as compared with mensuration performed on a full frame of photography. Factors to be included shall include but not be limited to:

(1) The method of producing the chip.

(2) The reference system used to relate the geometry of the chip and the full format to the imagery collection system.

(3) The ~~type and~~ accuracy ~~of the~~ comparator ~~used (i.e., stereo/mono, least count, optical quality)~~, and the type of individual doing the photo pointing.

(h) Prepare an analysis of the theoretical quality that can be obtained in a step-and-repeat chip printer (with a limited format area) as compared with the quality that can be achieved in continuous roll printers such as the Eastman Kodak NIAGARA printer. Factors to be taken into consideration shall include but not be limited to:

(1) Modulation Transfer Function

(2) Resolution

(3) Geometric distortion

(4) Dimensional stability of copy material

(5) Base stability (flatness)

(6) Color control manipulation

(7) Flexibility

(8) Image enhancement

(i) Investigate the storage and retrieval aspects to determine the most efficient, timely, and cost effective techniques for making the chips available ~~to the image analyst~~ on an on-call basis. ~~Factors to be taken into consideration shall include but not be limited to:~~

~~(1) Chip holders~~

(2) ~~Chip protection~~

(3) Decentralized units of organization files or individual (shoe box) files.

(4) Centralized files and distribution techniques.

~~(5) Machine readable accession data.~~

(6) ~~Effects of size: how large a chip can be efficiently stored and retrieved.~~

(7) Updating and purging techniques

(8) Display techniques

What are Rec'd requirements?

X ~~(j) Prepare a test and evaluation plan for the 4" X 5" chip printer and printer-processor now under development by the NPIC.~~

3.2. Evaluation Criteria. In developing the alternative conceptual designs, the following criteria will be utilized for evaluation purposes. ~~In presenting the conceptual design,~~ current procedures should also be evaluated, ~~utilizing the applicable portions of~~ the following criteria, so that judgment can be made as to the amount of improvement the implementation of the proposed concept is designed to achieve.

3.2.1. Form & Organization of Information. A measure of how adequate the form, organization, and content of the chip agrees with ~~that~~ the requirements ~~required by~~ of the user for optimum performance of ~~their~~ his functions.

Structured data or information printed to the user

3.2.2. System Performance. a) Time from input into the system of a request for ~~a chip~~ data until it is made available to the requestor, ~~either~~ by ~~origination or retrieval~~ his needs. b.) Currency of data in the system relative to compared with user requirements for currency.

3.2.3. Reliability. Consistency of expected performance and ability of system to perform major functions in event of individual component failure.

3.2.4. Ease of Phase In. An indication of the amount of disruption of Center activities which will be experienced during implementation of ~~th~~ the system.

3.2.5. Expandibility. Difficulty (time, manpower, & cost) of adding to the system to meet increased demands.

3.2.6. Flexibility. Ability of the system to handle new or unexpected demands.

3.2.7. Compatibility. A measure of the ability of the system to function harmoniously with the automated and non-automated systems within and external to the Center. Of specific importance are CHIVE, COINS, ~~as~~ the D.O.D. 70mm X 100mm system, ~~and~~ Microfiche, DOD Mincom 2/File Search, etc.

3.2.8. Facility Requirements. The need for unusual site preparation, utilities, communication circuits, etc.

3.2.9. Personnel Requirements. The number and types of skills required for system operation.

3.2.10. Total System Cost. This includes all initial and operational costs. Initial implementation costs should be separated from predicted annual operating costs.

3.3. Phase II, ~~Objectives~~, Three reports are also to be delivered under the System Equipment Definition Phase (Paragraph 2.2.3). The first report, covering item (a) below, will include the comparison of alternates mentioned in Paragraph 2.2.3 and will utilize the same criteria (Paragraph 3.2 ~~1.3.1~~.) for comparison, specified for the comparison of concepts in Phase I. The second report covering item (b) ~~and (c)~~ below, will be such that it is suitable for use as a basis of a Request for Proposal directed toward Phase III (Paragraph 2.2.4) without extensive rewrite or modification. the Classified report with classified attachments (c) below.

(a) Development and evaluation of alternate methods for accomplishing the functions of the system defined by the conceptual design resulting from Phase I. Alternate methods for accomplishing the major subsystem tasks will be evaluated and reported upon, as well as alternates for accomplishing the overall system functions.

(b) Establishment of a detailed system configuration including overall operation, description and detailed specifications of system components and component interfaces. Detailed specifications should be divided into logical subsets to permit use of multiple contractors for Phase III.

(c) Preparation of a detailed implementation plan (PERT) for the system. Budgetary costs and schedules for procurement and installation of equipment, facilities preparation, system testing, and personnel training should be included.

4. GENERAL.

4.1. Proposals. The proposals should be comprehensive, well-organized, explicit, clear, concise, and limited in content to that information required to qualify the prospective bidder, and demonstrate ability to perform satisfactorily within the scope of this document. The format of the proposal should be arranged to separate it into three detached parts: (1) technical description, (2) funding, and (3) personnel qualification and company capability. Cost proposals should be presented in such a manner that the cost of Phase I can be readily separated from the cost of Phase II.

4.1.1. While it is the wish of the Government to accomplish the aims of this program as expeditiously as possible, sufficient time should be allotted for a thorough accomplishment of the aims set forth herein. Tentatively, it is envisioned that the program (Phase I + II) be completed within one year from the time that an adequate number of contract personnel have been cleared. Adequate time (approximately four weeks) shall be allowed for Government review and checking following the issuance of each report (both interim and final) required under this program, since in each case the content of the reports will form the basis for subsequent work.

4.1.1.1. As a result of Government review a limited amount of revision and rewrite may be required. Proposals submitted hereunder should include provisions for this contingency.

4.3. Program Interface. Although the work to be performed under the terms of this document is confined to the development of a (non digital) material handling system, interfaces will exist between this program and other studies underway within NPIC. It is anticipated that liaison between the contractor selected for this program and the contractors conducting related internal studies will be such that this program will result in a compatible and integrated system.

4.4. Administration. The Government will retain overall controll of this program. Written approval from the contracting officer must be obtained before any changes in objectives, costs, or priorities are effected or before any subcontractor or consultant is employed.

4.5. Contractor Responsibility. The contractor is expected to provide competent and cooperative administrative service. He will be vested with certain authority to control the direction and degree of technical effort within the bounds of the estimated costs. As a part of his overall responsibility, the contractor will be responsible for the work performed by all of his subcontractors and consultants. The fact that the Government has granted approval of the use of a specific subcontractor or consultant (See Paragraph 4.4) in no way relieves the contractor from this responsibility.

4.6. Technical Representatives. The contracting officer will designate a technical representative to authorize specific development efforts of the contractor. Such authorization shall be given in writing in its original form or in confirmation of an oral authorization. The contractor will accept no other authorization or direction except that of the technical representative or contracting officer.

4.7. Reports. Regular reports will be required throughout the life of the contract. All reports will meet the basic requirements of specification DB-1001, dated 31 August 1966, GENERAL REQUIREMENTS FOR CONTRACTUAL DOCUMENTATION,

attached hereto.

4.7.1. Monthly Progress Reports covering each specified phase or subphase of this program will be submitted.

4.7.2. Final Reports will be submitted as indicated and will contain the information described under each Phase of this program.

4.7.3. Detailed Specifications. Submitted under Phase II will conform to Documentation standards agreed to by the Technical representative and the contractor.

4.8. Computer Interface. Inasmuch as NPIC operates a central computer system providing remote on-line services, it is mandatory that any operation concept presented under the proposed plan be compatible with the existing and planned computers.

4.9. Personnel Availability. Where possible, the contractor must make maximum use of Government expertise, particularly in the field of interpretation, and mensuration. To perform required experiments, the contractor may extablish, supervise, and evaluate tests, utilizing Government personnel to derive the necessary informationto bring this project to fruition.